STUDIES IN AUSTRALIAN SHARKS, No. 2.

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GALEUS ANTARCTICUS, *Günther.*

(Fig. 19).

IT was known to Aristotle, some 350 years B.C., that of two common "Hounds" of the Mediterranean, the embryos of one were developed by the medium of a placenta produced in the uterus, and that the embryos of the other were developed without such placenta. The condition in the former species, *Mustelus lævis*, is thus described by Balfour[1]:—"The vascular surface of the yolk-sack becomes raised into a number of folds, which fit into corresponding depressions in the vascular walls of the uterus. The yolk-sack becomes in this way firmly attached to the walls of the uterus, and the two together constitute a kind of placenta."

In 1882, the late Prof. T. J. Parker made the interesting discovery that the embryos of *Galeus antarcticus* do not lie freely in the uterine cavity, but are each confined in a separate compartment. I quote the following passage[2]:—"I was considerably surprised to find, on dissecting a gravid female of *M. antarcticus*, that the relations between the mother and the fœtus were nothing like so simple as I had expected, but that, just as the *Mustelus levis* [*lævis*] furnishes a sort of foreshadowing of the true placenta of mammals, so *M. antarcticus* is provided with membranes which, although formed from the maternal and not from the fœtal tissues, foreshadow in a remarkable manner the chorion and the amnion."

It was perhaps a careless reading of this passage which led me, in a recent work, to write as follows[3]:—"Parker has described how, in this species, the embryo is attached to the uterus with a placenta." This matter is again brought under my notice from the circumstance that on June 10th last, the Trustees received material which fell to my lot to examine.

On the previous day a man fishing in Maroubra Bay caught a Shark, and finding that it contained young, sent them, together with some viscera, to the Museum. I first picked out a young one for determination, and identified it as *Galeus antarcticus*. Turning to the other contents of the bottle, I saw that it included portions of the uteri, considerably torn. Each uterus is divided

1 Balfour—Comp. Embryology, ii., 1881, p. 54.

2 Parker—Trans. N.Z. Inst., xv., 1883, p. 219.

3 Waite—Aust. Mus. Mem., iv., Fishes, 1899, p. 33.

into several compartments; some of the divisions had been ruptured, and one had furnished the example first examined. As far as could be ascertained, the uterus is exactly as described and figured by Parker, and to his description I need only add that the shell-glands are of unusual size and shape; each consists of a pair of lateral lobes 7·5 mm. in diameter, thickened distally and bent inwards, presenting the convex side to the body of the uterus; the whole forms a sub-reniform body, measuring 19 mm. in length, and 23 mm. in breadth. (Fig. 19).

Prof. W. A. Haswell suggested to me that the chitinous lining of the uterus may be the product of these glands; he now writes as follows:—"Mr. Thomas Steel has tested the membrane from the uterus of *Mustelus antarcticus* and finds that it consists of the same material as the egg-shell of Cestracion (and of other oviparous Elasmobranchs), namely keratin. This seems to support the view that the 'membrane' in question is not formed from the epithelium of the uterus, but is really a vestigial shell, or more accurately, several vestigial shells united together, their substance being secreted by the shell-gland."

Five young were sent to us, all in an equal state of development, one of the divisions contained a yolk-sac, fully charged, but no development had taken place. The following are the dimensions of a fœtus:—

	mm.
Total length	156
Length of head to 1st gill-slit... ...	30
Width of head	23
Snout to front margin of eye	11
Diameter of eye	9
Snout to spiracle	21
Snout to mouth	21
Width of mouth	11
Height of body...	14
Snout to vent	78
Snout to 1st dorsal fin...	50
Snout to 2nd dorsal fin...	95
Intradorsal space	31
Snout to pectoral fin	35
Snout to ventral fin	72
Snout to anal fin	103
Length of caudal fin	35

The colour when first received was pinkish, yellowish in parts, and white below. The back is crossed by nine dark purple bars; one between the eyes, one over the gill-slits, one at the origin and another at the posterior insertion of the first dorsal, two on the intradorsal space, two at the base of the second dorsal, and one on the caudal peduncle. The fins are yellower than the body, and the front edge of both the dorsals is black.

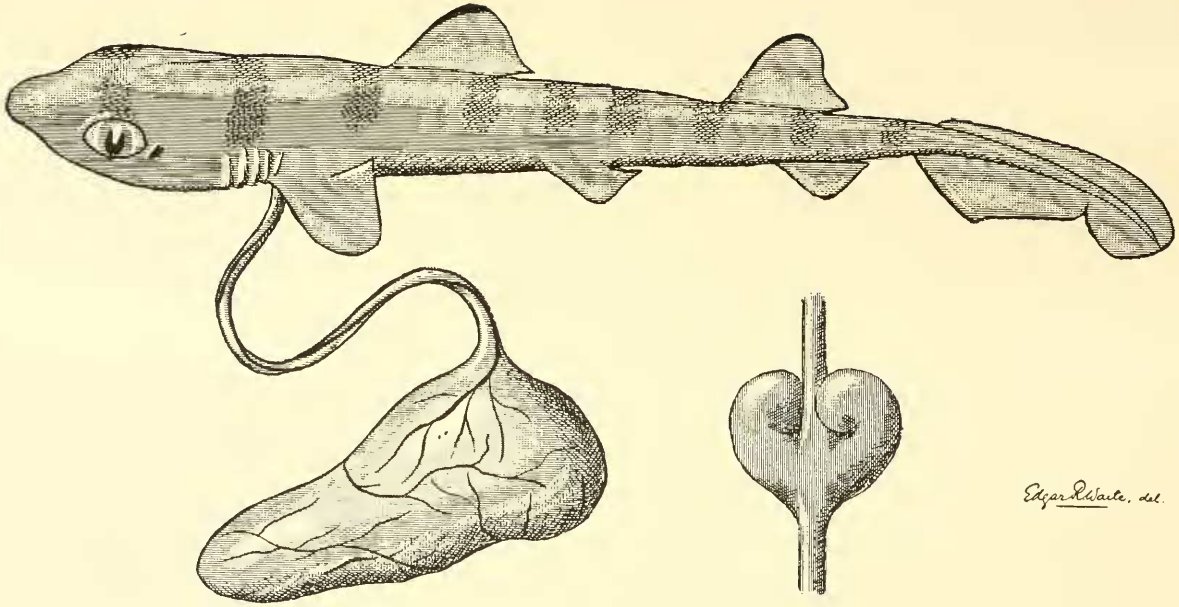

Fig. 19. *Galeus antarcticus*, Günther. Fœtus and shell-gland of adult, both natural size.

The most striking feature of the fœtus is the peculiar yolk-sac. It is not globular like the sac of all other forms I have seen, but greatly elongate, its length being more than twice its major diameter ; it is also larger at one end than the other. The entrance of the umbilical vessel is neither terminal nor median, but to the side of the larger end, its position being very similar to that of the œsophageal entrance at the cardiac end of the human stomach. The umbilical vessel is slender and of great length, its diameter is not more than 2 mm., while its length is 78 mm. or exactly half that of the total length of the fœtus. The colour of the yolk, seen through the investing membrane, is a bright orange, precisely similar to that of a fowl's egg.

The significance of the singular shape of the yolk-sac and the length of the umbilical cord, is not difficult to comprehend. When first formed, the sac fills its section in the uterus ; as the fœtus develops it becomes longer than the chamber, and the tail curves round. A space is thus formed, wider behind where the bend occurs, and narrower in front where the tail touches the body. This space is occupied by the yolk-sac, to which its shape exactly adapts it.

The umbilical cord, entering the yolk-sac at the larger or hinder end, requires to be of great relative length to reach the umbilicus of the fœtus. As the Shark still further increases in size, the umbilicus travels backwards (in relation to the chamber) and a shorter cord is therefore necessary. The shortening of the cord is also favoured by the shrinkage of the yolk-sac and the movements of the fœtus, until at birth, when the sac is smaller than a pea, the length of the cord is not remarkable.